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The Valuation Implications of Abandonment Decisions

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The Valuation Implications of Abandonment Decisions

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THE VALUATION IMPLICATIONS OF ABANDONMENT DECISIONS

ABSTRACT

This paper relates the Abandonment Strategy for real-assets to other means of restructuring corporate organizations. The overall role of the abandonment option in the capital budgeting process is considered and potential implications of implementing the strategy are outlined. The valuation consequences may have a variety of net impacts, and the issue calls for empirical analysis. The empirical work suggests that abandonment is associated with both positive and negative valuation consequences. In an attempt to identify the critical characteristics of abandonment which may determine whether the net effect is positive or negative, the sample is partitioned into cases associated with an accounting write-off, and those without. The average valuation consequences are somewhat different for these subsamples, but the identification of the determinants of valuation changes remains a challenge for subsequent research.

THE VALUATION IMPLICATIONS OF ABANDONMENT DECISIONS

1. INTRODUCTION

The restructuring of corporate assets has reached record levels of activity in recent years. The motivations for this activity, and its financial and other implications continue to receive extensive attention in both academic and practitioner literature. Dodd (4) and Jensen and Ruback (13) have examined mergers; Hite, Owers, and Rogers (1) and Jain (12) examined divestitures; Hite and Owers (8, 9), Hite, Owers and Rogers (10) and Schipper and Smith (18) evaluated spin-offs; Finnerty, Owers and Rogers (6) and McConnell and Nantell (15) studied joint ventures; DeAngelo, DeAngelo and Rice (3) looked at going private transactions; and Hite, Owers and Rogers (11) examined voluntary liquidations. Berton and Miller (1) mirror the implementation of restructuring strategies with reports of such activity, and a consideration of the benefits from this activity from a practitioners perspective.

This paper examines another type of asset management strategy--the abandonment of in-place assets, frequently associated with an accounting write-off. The abandonment strategy has several important differences from other restructuring strategies. These differences cause the strategy to be of interest in itself, and additionally may provide further insights into unresolved issues associated with restructuring.

The abandonment of a subset of a firm's operations is part of the overall decision process relating to real capital assets. Robichek and Van Horne (16) drew attention to the need to consider the abandonment option implicit in the capital budgeting process if capital is to

be optimally allocated. The work of Robichek and Van Horne has been extended by the works of Dyle and Long (5), Bonini (2), and Gaumnitz and Emery (7). These works have generally established necessary and sufficient conditions for the abandonment decision to be the optimal alternative. Over the sequence of papers, there has been generalization of these conditions, and application of different decision techniques, for example simulation, and dynamic programming.

Given the capital budgeting context, the valuation consequences of abandonment can be placed in the context of the findings of McConnell and Muscarella (14), who found that firms are, on average, able to identify positive net present value (NPV) investment projects. Part of the goal of this paper is to investigate whether firms can identify positive NPV abandonment scenarios.

The following two sections examine the abandonment decision, considering its place in the capital budgeting decision process, the motivations for use, and the potential financial consequences for the firm. Section four provides details of the empirical procedures employed to test the hypotheses derived from the developments in sections two and three. The empirical findings of the study are then presented, and related to other analyses of the abandonment decision. The paper concludes with a review of the major issues associated with asset abandonment, and suggestions for further research.

2. THE ABANDONMENT DECISION

The decision to abandon a subset of a firm's operations can be conditional or absolute. The former occurs when the operations in

question are greatly scaled back, or when they are put into temporary inactivity, with the anticipation of reactivating the assets at a later time. An absolute abandonment decision is one that is irreversible, for either technological or strategic reasons. The absolute abandonment is essentially a sell-off in which the asset has little value to the present owner.

We distinguish abandonment decisions from the voluntary liquidation strategy. In the latter, there is a complete disposal of all corporate operating units, obligations of the firm are settled, and the residual assets are distributed in the form of a liquidating dividend. There is not necessarily a circumstance or connotation of bankruptcy. The abandonment decision results when a firm ceases a subset of its operations, but continues as an operating company; neither the organization form or its essential operating nature are ended. While a firm could conceivable abandon an asset (or unit) rather than sell it to another firm, we contend that if a firm is ending a particular type of operations, then it will generally choose a sell-off over an abandonment where the opportunity exists. As in the case of voluntary liquidations, there is not necessarily (or even typically) an overall condition of financial distress present when abandonment decisions are made. In the case of abandonment, there is typically substandard performance by the terminated unit.

Robichek and Van Horne (17) noted that "...a project should be abandoned at that point in time when its abandonment value exceed the net-present-value of the subsequent expected future cash flows

discounted at the cost-of-capital." Thus, their decision directed abandonment if:

$$AV_t > PV_t = \sum_{t=\tau+1}^{n} \frac{EC_{t\tau}}{(1+k)^{t-\tau}} \qquad (1)$$

where:

AV_t = abandonment value at time t,

$EC_{t\tau}$ = expected value of cash flows in year τ at time t,

k = the cost of capital applicable to the project, and

n = the number of residual years in the project life.

The contribution of Dyle and Long was to note that abandonment at the first point in time when condition (1) was satisfied could result in sub-optimal micro investment decisions. At time t, the expected NPV of abandonment and of continuation should be calculated for each of the remaining decision points, and the project abandoned at that point in time with the highest NPV of abandonment, subject to condition (1). The work of Bonini considered a dynamic programming model for making the decision, and Gaumnitz and Emery consider the impacts of different assumed rates of reinvestment, and how to examine abandonment of a real asset when replacement of the asset's services is contemplated--the 'like-for-like' decision. The need to consider abandonment in the context of like-for-like can generate a different decision from the absolute abandonment context, where the services of the abandoned unit are not replaced.

3. POTENTIAL VALUATION IMPLICATIONS

There is now an extensive literature, both academic and practitioner, regarding the valuation implications of many restructuring strategies, however, there has been little attention to abandonment as a manifestation of restructuring.[1] Given the voluntary nature of most restructuring activity, it is reassuring that in the majority of previous studies, a positive valuation effect has been found to follow. This is reassuring in the sense that it confirms the "maximize stock price" goal by which financial decisions are supposedly guided.

In addition to restructuring, abandonment decisions can be considered within the contest of capital budgeting. Although the follow-up to the initial investment decision does not typically receive the same attention, the tools used for the abandonment decision are the same as those recommended for the initial decision.

The normative decision rule of accepting projects with positive NPV implies that firms undertaking projects will increase in value as a result. The work of McConnell and Muscarella (14) develops these notions and undertakes empirical analysis. Within a Capital Asset Pricing Model (CAPM) context, the evidence supports the hypothesis that firms can identify capital projects that plot "above the Security Market Line (SML)." This is in marked contrast to the case with financial assets, where the evidence supports market efficiency and the implication that financial assets plot on the SML.

If real-asset projects typically plot above the SML, then the central empirical question addressed by this paper is: "where do real-asset abandonment opportunities plot relative to the SML?" That

the abandonment alternative for a project is being considered is a signal that the ex-post realization on the project is dominated by the ex-ante state of the world at the time the investment decision was made. The market will have identified the ex-post project-state, and the negative valuation implications will have become incorporated in the value of the firm. The focus of this study is thus on the immediate valuation consequences of the abandonment decision itself. The ability to identify the separate effect of the valuation consequences of suboptimal project-states is confounded by the length of the interval over which it occurs.

Given the evidence on the ability of corporate decision makers to identify positive NPV real-asset capital projects, and the voluntary nature of abandonment decisions, the hypothesis that the valuation implication of abandonment will have a positive effect on firm value is appealing. But this hypothesis should be tested--the outcome is not inevitable. Given the option of abandonment, it can be asked why management would ever continue with a project when the benefits of continued operation do not exceed the costs of with abandonment. The normative implications of this perspective suggest that there will be no valuation consequences of abandonment. Yet the difficulties of estimation of future costs and benefits may apply not only to external investors and analysts, but also for managers. The distribution of NPV of abandonment may not be fully specified.[2] For example, the opportunity cost of managerial resources released for other firm activities may be difficult to estimate. Will a "cleaner house" result in higher value being generated from continuing operations? If so, this

represents an incremental element to be incorporated into the decision process. Material cash costs are frequently triggered by the decision to abandon a unit. For example, labor resource contracts may require severance payments. The abandonment strategy often has negative accounting consequences associated with its implementation--write-offs are frequently required as a result of the decision. These accounting effects are potentially offset by positive tax implications for cash flows, and several of the other posited benefits associated with restructuring.

Thus, while the generally voluntary nature of abandonment decisions might suggest that the net effect is positive, examination of all the issues raises doubts about the inevitability of this conclusion. We undertake an empirical examination of the issues in this paper, and examine the overall valuation consequences and whether particular characteristics of abandonments affect these consequences.

4. SAMPLE, DATA AND METHODOLOGY

The sample for the study was identified from two sources. The Dow Jones News Service electronic text search was employed to identify a sample of abandonments from the financial press. In these cases, there is not necessarily a write-off. The Compustat Industrial data tapes were used to identify a sample of abandonment transactions where a write-off was associated with the decision.[3] Significant sample work was necessary to map from the Compustat listing of write-offs to the published announcements. To be included in the sample, it was necessary that a clear identification of Compustat recorded write-offs

could be made with a specific abandonment decision.[4] This resulted in substantial attrition of sample size from the initial Compustat listing--in the majority of cases, a search of the Wall Street Journal and its Index did not establish such a link--the write-offs were the aggregation of several occurrences and decisions within the firm.

The combined examination of the text-search and the filtered Compustat listing generated a sample of 71 abandonment decisions after confounded occurrences were excluded. Of these, 26 had write-offs associated with them. The complement subset is the majority of cases where no write-off consideration was mentioned in the associated press release. In contrast, for some transactions, there was an explanation given as to why there was no write-off. Typical reasons were (i) no book value remaining, (ii) earlier provision in an overall write-down, without specific references to the unit later abandoned, and (iii) sufficient residual value in the abandoned unit to negate the need for a write-off. Given disclosure requirements, we assumed that when no write-off was mentioned, then either the amount was immaterial, or one of the three reasons identified applied.

Stock returns data were obtained from the CRSP daily returns tapes. Examination of the reaction of equity values to the abandonment announcement used established event study statistical techniques. The appendix provides details of the techniques by which market model parameters were identified over an interval from 200 trading days before the abandonment announcement to 51 days before. The "event window" is from 50 days before, to 50 days after, the abandonment announcement. In the presentation and discussion of results, particular emphasis is

given to the shorter interval around the announcement. Because no other firms are involved in a negotiation process, the potential for leakage of the abandonment decision is small.

5. RESULTS

5.1 Overall Results

Table 1 presents the day-by-day Prediction Errors (PEs), their cumulation from day -50 (CPE), and the sample size (for which daily returns were available) for all abandonment decisions examined. The economic magnitudes are small: on day -1, the prediction error is -0.2%, and on day 0, 0.1%. Reflecting these small valuation effects, the test statistics in Table 2 do not indicate that they are statistically different from zero.

Closer examination of the statistical analysis showed two related characteristics of the individual company results--there are approximately even numbers of (material) positive, and negative, prediction errors, and thus the statistical tests of the difference between the numbers of positive and negative outcomes were insignificant for most days in the interval (-50, +50). The average valuation effect is not significantly different from zero, but this is the result of approximately offsetting positive and negative consequences, rather than all cases being insignificantly different from zero.

In an attempt to identify the differentiating characteristic(s) that determine whether the valuation consequences are positive or negative, we proceeded to look for potential partitioning characteristics. This led to an investigation of the effects of a write-off being associated with an abandonment.

5.2 Abandonments with Write-offs

Some of the abandonments resulted in write-offs while others did not. The reasons for this were identified in section three, where the potential valuation consequences of a write-off per se were introduced. Where there is a write-off, there is a potentially beneficial cash flow consequence via a decreased tax obligation. We thus examined abandonments with and without write-offs separately.

For the write-off subsample, Table 3 reports the patterns of prediction errors, and their cumulation, over the interval from -50 days before the announcement to 50 days after. The format of Table 3 is the same as that of Table 1. Although the results are not strong, there is evidence that the abandonment itself was associated with positive valuation consequences for this subsample. The prediction error on day -1 was 0.1%, and that on day 0, 0.8%, the two-day accumulation having a test statistic of 1.57 (as indicated in Table 2). The Cumulative Prediction Error (CPE) over the interval was generally negative, as indicated in Table 2, but the focus here is on the short interval around the abandonment announcement.

5.3 Adandonments without Write-offs

Table 4 presents the daily results for the subsample without a write-off associated with the abandonment. Focusing again on the immediate announcement period, there is some evidence of a negative average response to such abandonments, the CPE over (-1, 0) being -0.6%, with a test statistic of -1.50.

The two-day effects for abandonments without a write-off are thus 1.5% less than for those where there is a write-off. This lends some support for the notion that the tax-shield effect of the write-off has an impact on average valuation effects. However, we are cautious not to present the write-off as the critical determinant of the valuation effect. The distribution of two-day (-1, 0) CPEs for the write-off subsample was generally wider than that for the complement subset. The average positive two-day CPE for the write-off subsample was +4.25%, in contrast to +2.33% for the no write-off group. The corresponding average negative two-day CPEs were -3.45% and -2.17% respectively.

5.4 Interpretation of Results

Although some progress appears to have been made toward identifying why some abandonment decisions generate positive valuation consequences, and others negative, we do not claim that the write-off characteristic is a particularly powerful discriminator. For example, we note that the largest positive two-day CPE (22.5%, in the case of Lockheed Corp.) and the largest negative two-day CPE (-14.3% for Notomas Co.) were both associated with write-offs. Furthermore, the test-statistics for the significance of the difference in number of positive and negative responses (reported in Table 2 panels B and C) do not suggest that the write-off characteristic explains the differing effects.

Previous work on the valuation consequences of abandonment by Statman and Sepe (19) employed a different sample from that in this paper. Their sample was identified from the Compustat Industrial Tape

from 1975 to 1981, while the sample employed in this paper was identified from that source over the interval 1979-1984, and the Dow Jones News Service, as detailed previously. Their sample appears to also have included sell-offs, whereas this study did not. Thus the differences in the overall findings may be attributable to sample characteristics. Generally, Statman and Sepe found larger valuation consequences than that reported in this paper, and they were positively significant. The results from their paper that relate most closely to those in this study are from non sell-off terminations, where they identify a two-day CPE of 1.16%. Given that their sample identifcation procedures identified only cases with write-offs, this finding should be compared with the 0.9% two-day CPE we identified for the write-off subsample in this study. In this sense the findings are compatible.

In summary, two features of the empirical analysis in this paper stand out. First, the magnitudes are small, and are of marginal statistical significance. More importantly, the average results reflect the net outcome of valuation consequences that vary from material positive to material negative, from one abandonment to another. We present the write-off partition as a start toward identifying the set of factors influencing what the valuation consequences will be, but more powerful discriminating characteristics remain to be identified. In contrast to the predominantly positive valuation consequences associated with other forms of restructuring such as spin-offs and sell-offs, the implications of this study are that management should take particular care in making an abandonment decision because of the variation of valuation consequences associated with such actions.

6. CONCLUSION

This paper examines the abandonment strategy and its effect on the value of the firm. Abandonment can be viewed as a restructuring decision or as a capital budgeting decision. In the context of restructuring, abandonment is similar to a sell-off of assets with no market value. As a capital budgeting decision, abandonment is an option that will be exercised when the ex-post state-of-the-project is less favorable than the average ex-ante state under which the investment decision was made. The implication of this discussion is that the valuation consequence of an abandonment might be positive or negative depending upon the characteristics of each case. This implication was supported empirically. Individual cases were associated with positive and negative CPEs and the overall effect was not significantly different from zero. In an attempt to identify the determinants of the valuation effect, the sample was partitioned according to whether there was a write-off associated with the abandonment. This suggested that the write-off characteristic does have some impact on the valuation consequences. However, we note that identification of other, more powerful, factors in determining what the valuation effects of abandonment will be remains a challenge for further work on this topic.

FOOTNOTES

[1]Although there has been relatively little research into the valuation consequences of abandonment, the potential for such activity to affect stock prices has been noted. For example, when U.S. Steel Corp. was closing plants in 1980, union negotiators conceded that there are problems about giving advance notification. Because a company's stock price might be affected by its decision to close a plant, such a disclosure presumably would be governed by the Securities and Exchange Commission regulations requiring public disclosure. Wall Street Journal, February 6, 1980.

[2]Bonini (2) notes that "Abandonment itself may produce positive cash flows such as tax effects for depreciation write-offs, sale of equipment, return of working capital, or the use of space by more profitable projects." (page 39).

[3]The Compustat variables examined were extraordinary items (Variable 48) and losses from discontinued operations (Variable 66).

[4]Specifically, the name of each company identified by Compustat as having losses as defined in footnote 3 was checked against the Wall Street Journal Index to identify the corresponding permanent operating asset abandonment. Explicitly excluded from the analysis were: construction abandonments by utilities, 'dry hole' abandonments in energy exploration, and temporary plant closings for the purpose of inventory adjustment.

REFERENCES

1. Berton, L., and G. Miller, 1986, "Accountants Debate Tightening Rules for 'Big Bath' Write-offs by Companies," Wall Street Journal, February 11.

2. Bonini, C. P., 1977, "Capital Investment Under Uncertainty with Abandonment Options," Journal of Financial and Quantitative Analysis, 12, 39-54.

3. DeAngelo, H., L. DeAngelo, and E. Rice, 1984, "Going Private: Minority Freezeouts and Stockholder Wealth," Journal of Law and Economics 27, 367-401.

4. Dodd, P., 1980, "Merger Proposals, Management Discretion and Stockholder Wealth," Journal of Financial Economics 8, 105-138.

5. Dyle, E. A., and H. W. Long, "Abandonment Value and Capital Budgeting: Comment," Journal of Finance, 24, 88-95.

6. Finnerty, J. E., J. E. Owers, and R. C. Rogers, 1986 "The Valuation Impact of Joint Ventures," Management International Review, 13, 138-156.

7. Gaumnitz, J. E., and D. R. Emery, "Asset Growth, Abandonment Value and the Replacement Decision of Like-For-Like Capital Assets," Journal of Financial and Quantitative Analysis, 15, 407-417.

8. Hite, G. L., and J. E. Owers, 1983, "Security Price Reactions around Corporate Spin-Off Announcements," Journal of Financial Economics 12, 409-436.

9. Hite, G. L., and J. E. Owers, 1984, "The Restructuring of Corporate America," Midland Corporate Finance Journal 2, 6-16.

10. Hite, G. L., J. E. Owers, and R. C. Rogers, 1985, "The Separation of Real Estate Assets by Spin-off," Journal of the American Real Estate and Urban Economics Association 13, 153-166.

11. Hite, G. L., J. E. Owers, and R. C. Rogers, 1986, "The Market for Interfirm Asset Sales: Partial Sell-offs and Voluntary Liquidations," forthcoming, Journal of Financial Economics Amherst, MA.

12. Jain, P. C., 1985, "The Effect of Voluntary Sell-off Announcements on Stockholder Wealth," Journal of Finance 40, 209-224.

13. Jensen, M., and R. Ruback, 1983, "The Market for Corporate Control," Journal of Financial Economics 11, 5-50.

14. McConnell, J. J., and C. J. Muscarella, 1985, "Corporate Capital Expenditure Decisions and the Market Value of the Firm," Journal of Financial Economics, 14, 399-422.

15. McConnell, J. J., and T. Nantell, 1985, "Corporate Combinations and Common Stock Returns: The Case of Joint Ventures," Journal of Finance 40, 519-536.

16. Minns, R., 1986, "Write-off Time: Why the Fourth Quarter Was So Bad," Business Week, March 17.

17. Robichek, A. A., and J. C. Van Horne, 1967, "Abandonment Value and Capital Budgeting," Journal of Finance, 22, 577-598.

18. Schipper, K., and A. Smith, 1983, "Effects of Recontracting on Shareholder Wealth: The Case of Voluntary Spin-offs," Journal of Financial Economics 12, 437-467.

19. Statman, M., and J. F. Sepe, 1984, "The Disposition to Throw Good Money After Bad: Evidence from Stock Market Reaction to Project Termination Decisions," Working paper, University of Santa Clara.

Table 1

Prediction Errors (PEs), Cumulative PEs from Day -50 (CPEs), and Sample Size for Specified Days Relative To Abandonment Announcement: Pooled Sample

Day	PE	CPE	Sample Size
-50	-0.001	-0.001	71
-40	0.001	-0.001	71
-30	-0.001	0.006	71
-20	0.002	0.001	70
-10	0.000	-0.006	70
-9	0.001	-0.005	70
-8	-0.003	-0.008	70
-7	-0.001	-0.009	70
-6	0.004	-0.006	70
-5	0.001	-0.005	70
-4	-0.003	-0.007	70
-3	-0.000	-0.007	70
-2	-0.002	-0.009	70
-1	-0.002	-0.011	70
0	0.001	-0.010	70
1	-0.000	-0.010	70
2	0.001	-0.009	70
3	0.004	-0.005	69
4	0.002	-0.004	69
5	-0.001	-0.005	69
6	-0.001	-0.005	69
7	0.002	-0.003	69
8	-0.001	-0.005	69
9	0.002	-0.003	69
10	-0.003	-0.006	69
20	0.002	-0.001	69
30	0.004	-0.000	69
40	0.003	0.009	69
50	0.001	0.019	68

Table 2

Tests of Significance of CPE Accumulation, and the Number of Positive and Negative Outcomes, over Intervals Relative to the Abandonment Announcement.

Panel A: Pooled Sample

Interval	CPE	CPE Test-Statistic	Test-Statistic for Positive/Negative
-50 to 0	-0.010	-0.23	0.12
-4 to 0	-0.005	-0.92	-0.48
-1 to 0	-0.001	-0.26	-1.20
-1	-0.002	-0.49	-0.24
0	0.001	0.12	-0.48
1 to 50	0.029	1.93	1.20

Panel B: Write-off Subsample

Interval	CPE	CPE Test-Statistic	Test-Statistic for Positive/Negative
-50 to 0	-0.029	-0.85	-0.74
-4 to 0	-0.002	-0.45	-0.20
-1 to 0	0.009	1.57	0.60
-1	0.001	0.53	-0.60
0	0.008	1.70	1.00
1 to 50	0.044	1.45	1.40

Panel C: No Write-off Subsample

Interval	CPE	CPE Test-Statistic	Test-Statistic for Positive/Negative
-50 to 0	0.001	0.36	0.75
-4 to 0	-0.007	-0.83	-0.45
-1 to 0	-0.006	-1.50	-1.94
-1	-0.004	-1.10	0.15
0	-0.002	-1.11	-1.34
1 to 50	0.020	1.33	0.45

Table 3

Prediction Errors (PEs), Cumulative PEs from Day -50 (CPEs), and Sample Size for Specified Days Relative To Abandonment Announcement: Write-off Subsample

Day	PE	CPE	Sample Size
-50	0.002	0.002	26
-40	-0.000	-0.013	26
-30	0.001	-0.007	26
-20	-0.001	-0.019	25
-10	-0.003	-0.013	25
-9	-0.001	-0.014	25
-8	-0.006	-0.020	25
-7	-0.007	-0.027	25
-6	-0.001	-0.028	25
-5	0.001	-0.028	25
-4	-0.004	-0.032	25
-3	-0.002	-0.033	25
-2	-0.004	-0.038	25
-1	0.001	-0.037	25
0	0.008	-0.029	25
1	-0.001	-0.030	25
2	0.001	-0.030	25
3	0.006	-0.024	24
4	-0.000	-0.024	24
5	-0.002	-0.027	24
6	0.005	-0.022	24
7	0.008	-0.013	24
8	-0.004	-0.017	24
9	0.005	-0.012	24
10	-0.004	-0.016	24
20	-0.002	-0.035	24
30	0.009	-0.021	24
40	0.002	-0.002	24
50	-0.002	0.016	23

Table 4

Prediction Errors (PEs), Cumulative PEs from Day -50 (CPEs), and Sample Size for Specified Days Relative To Abandonment Announcement: No Write-off Subsample

Day	PE	CPE	Sample Size
-50	-0.002	-0.002	45
-40	0.001	0.005	45
-30	-0.002	0.014	45
-20	0.004	0.013	45
-10	0.002	-0.002	45
-9	0.002	0.000	45
-8	-0.001	-0.001	45
-7	0.002	0.001	45
-6	0.006	0.008	45
-5	0.001	0.009	45
-4	-0.002	0.007	45
-3	0.001	0.008	45
-2	-0.000	0.007	45
-1	-0.004	0.003	45
0	-0.002	0.001	45
1	0.000	0.002	45
2	0.001	0.002	45
3	0.003	0.006	45
4	0.003	0.009	45
5	-0.001	0.008	45
6	-0.004	0.004	45
7	-0.001	0.003	45
8	-0.000	0.003	45
9	-0.000	0.003	45
10	-0.003	-0.000	45
20	0.004	0.018	45
30	0.001	0.011	45
40	0.003	0.016	45
50	0.003	0.021	45

APPENDIX

Methodological Details

The series of abnormal returns (prediction errors) over the 81 day trading day interval from 50 days before the event date (day -50) to 30 trading days after the event date (i.e., -50, 30) is identified and statistically analyzed.

It is assumed that the one-factor market model (1) is a valid representation of the return generating process.

$$\tilde{R}_{jt} = \tilde{\alpha}_j + \tilde{\beta}_j R_{mt} + \tilde{\varepsilon}_{jt} \qquad (1)$$

where:

$\tilde{R}_{jt}$ = The rate of return on security j over period t, the unit being one trading day.

$\tilde{R}_{mt}$ = The rate of return on the value weighted market portfolio over day t.

β_j = Covariance($\tilde{R}_{jt}$,$\tilde{R}_{mt}$/Variance($\tilde{R}_{mt}$).

α_j = $E(R_j) - \beta_j E(R_{mt})$.

$\tilde{\varepsilon}_{jt}$ = The residual return on security j in period t. The assumptions relating to ε are:

$$E(\tilde{\varepsilon}_{jt}) = 0,$$

$$Var(\tilde{\varepsilon}_{jt}) = \sigma^2(\tilde{\varepsilon}_j), \text{ and}$$

$$Cov(\tilde{\varepsilon}_{jt}, R_{mt}) = 0.$$

Use of the model is based on the bivariate normality of security and portfolio returns.

The parameters of the market model were estimated over the interval (-200, -51). For each trading day in the interval (-50, +30), the prediction error for firm j is:

$$\varepsilon_{jt} = PE_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt}) \tag{2}$$

where $\hat{\alpha}$ and $\hat{\beta}$ are estimated over (-200, -51).

For each trading day t, t ε (-50, +30), the average prediction error is defined as:

$$APE = (1/N_t) \sum_{j=1}^{N_t} PE_{jt} \tag{3}$$

where:

N_t = The number of firms with an abnormal return defined in day t.

The cumulative average prediction error is defined as:

$$CAPE_T = \sum_{t=-50}^{T} APE \tag{4}$$

The cumulative average prediction error over the interval t_1 to t_2 inclusive is:

$$CAPE_{t_1}^{t_2} = \sum_{t=t_1}^{t_2} APE \tag{5}$$

and the interval has length $L = t_2 - t_1 + 1$.

To test the hypothesis of zero abnormal returns in event day t, the following test statistic is calculated:

$$t = APT_t/\sigma_t \tag{6}$$

where:

$$\sigma_t = (1/80) \{ \sum_{\substack{i=-50 \\ \neq t}}^{+30} (APE_1 - (\sum_{\substack{i=-50 \\ \neq t}}^{+30} APE_1/80))^2 \}^{1/2}$$

To test the hypothesis of zero abnormal return accumulation over specified intervals (t_1, t_2), the Z test statistic of the following derivation is employed. The standardized abnormal return for firm j in period t is defined as:

$$SPE_{jt} = PE_{jt}/\sigma(PE_{jt}) \tag{7}$$

where:

$$\sigma^2(PE_{jt}) = \sigma_\varepsilon^2(1 + (1/n) + \frac{(R_{mt} - \overline{R}_m)^2}{\sum_{\tau=1}^{n} (R_{m\tau} - \overline{R}_m)^2})$$

σ_ε^2 = The estimated variance of the disturbance term from the OLS estimation of the market model for security j.

$\overline{R}_m$ = The mean return on the value weighted market portfolio over the parameter estimation interval for security j.

n = The number of observations (length of the interval) over which the parameters are estimated (n=150).

The average standardized prediction error over N firms with prediction errors defined in day t is defined as:

$$ASPE = (1/N) \sum_{j=1}^{N} SPE_{jt} \tag{8}$$

and the average standardized prediction error over the interval I (with trading day extrema t_1 and t_2), is

$$ASPE_I = (1/L) \sum_{t=t_1}^{t_2} ASPE_t \tag{9}$$

where $L = t_2 - t_1 + 1$.

The cumulation of average standardized prediction errors over the interval I is:

$$CASPE_I = \sum_{t=t_1}^{t_2} ASPE_t \tag{10}$$

When the number of firms (N) is sufficiently large, the statistic defined in (11) and (12) has a distribution that approximates the standard normal. This statistic is employed to test the null hypothesis of zero accumulation of abnormal returns over a specified interval relative to the event.

$$Z = \frac{ASPE_I}{\left(\frac{(n-2)}{(n-4)}\right)^{1/2} \cdot (NL)^{1/2}} \tag{11}$$

$$= \left(\frac{N}{\frac{L(n-4)}{(n-2)}}\right)^{1/2} (CASPE_I) \tag{12}$$

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